

The opinion in support of the decision being entered today was not written for publication in a law journal and is not binding precedent of the Board.

Paper No. 15

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHI S. CHANG,
MICHAEL J. JOHNSON,
CRAIG N. JOHNSTON,
and JOHN M. LAUFFER

Appeal No. 1998-1408
Application No. 08/569,529

ON BRIEF

Before BARRETT, FLEMING, and BARRY, Administrative Patent Judges.

BARRY, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1-7 and 15-18. We affirm-in-part.

BACKGROUND

The invention at issue in this appeal relates to transformers. Transformers are used for power supplies, power converters, and other circuits where electrical/ground

isolation, impedance matching, or voltage transformations are required.

Known transformers comprise a ferrite core and primary and secondary windings wrapped around the core. Typically, the shape of the core is torroidal. The primary and secondary windings are wrapped around the sidewalls of the core and either interlaced with each other or wrapped around separate sections of the core.

A transformer formed with a printed circuit board (PCB) is also known. Specifically, the transformer's core is mounted onto the PCB. Underneath the core, elongated conductors printed thereon form segments of respective windings. Metallic wires are contoured over the top and two sides of the core, and are wire-bonded to ends of respective printed conductors to form continuous strings of primary and secondary windings, which surround the core. While this arrangement offers a low profile and incorporation with a PCB, its cost of construction is high.

The inventive transformer comprises a PCB having elongated conductors printed thereon, a ferrite core having a bottom mounted on the PCB, and a flex circuit contoured around a top and sides of the core. More specifically, the flex circuit comprises a dielectric sheet and elongated conductors printed on both faces thereof. The conductors of the flex circuit are surface bonded to respective conductors of the PCB to form a series of primary windings and a series of secondary windings around the core. Providing the upper portions of the windings by means of the flex circuit reduces the cost of construction because it does not require handling of discrete conductor portions.

Claim 1, which is representative for our purposes, follows:

1. An electromagnetic device comprising:

a printed circuit board having elongated conductors printed thereon;

a ferrite core having a bottom mounted onto said printed circuit board; and

a flex circuit comprising a flexible dielectric sheet and elongated conductors printed on said sheet, said flex circuit being contoured around

a top and sides of said core, said conductors of said flex circuit being surface bonded to respective conductors of said printed circuit board to form a series of windings around said core.

The references relied on in rejecting the claims follow:

Layton et al. (Layton)	4,308,513	Dec. 29, 1981
Dirks	4,975,671	Dec. 4, 1990
Sato ¹ (Japanese Patent Publication)	2-10705	Jan. 16, 1990.

Claims 1-7 and 15-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Sato in view of Layton and Dirks. Rather than repeat the arguments of the appellants or examiner in toto, we refer the reader to the brief and answer for the respective details thereof.

OPINION

¹A copy of the translation prepared by the U.S. Patent and Trademark Office is included and relied upon for this decision. We will refer to the translation by page number in this opinion.

In reaching our decision in this appeal, we considered the subject matter on appeal and the rejection advanced by the examiner. Furthermore, we duly considered the arguments and evidence of the appellants and examiner. After considering the totality of the record, we are persuaded that the examiner did not err in rejecting claims 1, 5-7, and 15-18. We are also persuaded, however, that he did err in rejecting claims 2-4. Accordingly, we affirm-in-part. Our opinion addresses the grouping and obviousness of the claims.

Grouping of the Claims

When the appeal brief was filed, 37 C.F.R. § 1.192(c)(7) (1997) included the following provisions.

For each ground of rejection which appellant contests and which applies to a group of two or more claims, the Board shall select a single claim from the group and shall decide the appeal as to the ground of rejection on the basis of that claim alone unless a statement is included that the claims of the group do not stand or fall together and ... appellant explains why the claims of the group are believed to be separately patentable. Merely pointing out differences in what the claims cover is not an argument ... why the claims are separately patentable.

In general, claims that are not argued separately stand or fall together. In re Kaslow, 707 F.2d 1366, 1376, 217 USPQ 1089, 1096 (Fed. Cir. 1983). When the patentability of dependent claims in particular is not argued separately, the claims stand or fall with the claims from which they depend. In re King, 801 F.2d 1324, 1325, 231 USPQ 136, 137 (Fed. Cir. 1986); In re Sernaker, 702 F.2d 989, 991, 217 USPQ 1, 3 (Fed. Cir. 1983).

Here, the appellants group claims 5, 6, and 7 with claim 1 and group claims 16 and 17 with claim 15. (Appeal Br. at 3.) They fail to state, let alone explain, however, whether claim 18 is believed to be separately patentable from claim 15, from which it depends. Therefore, we consider the claims to stand or fall together in the following groups: claims 1 and 5-7, claims 2-4, and claims 15-18. We select claims 1, 2, and 15 to represent the respective groups. Next, we address the obviousness of the claims.

Obviousness of the Claims

We begin by noting the following principles from In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993).

In rejecting claims under 35 U.S.C. Section 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).... "A prima facie case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." In re Bell, 991 F.2d 781, 782, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993) (quoting In re Rinehart, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976)). If the examiner fails to establish a prima facie case, the rejection is improper and will be overturned. In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988).

We also find that the references represent the level of ordinary skill in the art. See In re GPAC Inc., 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995) (finding that the Board of Patent Appeals and Interference did not err in concluding that the level of ordinary skill was best determined by the references of record); In re Oelrich, 579 F.2d 86, 91, 198 USPQ 210, 214 (CCPA 1978) ("[T]he PTO usually must evaluate ... the level of ordinary skill solely on the cold words of the literature."). Of course, "[e]very patent application and reference relies to some extent upon knowledge

of persons skilled in the art to complement that [which is] disclosed' " In re Bode, 550 F.2d 656, 660, 193 USPQ 12, 16 (CCPA 1977) (quoting In re Wiggins, 488 F.2d 538, 543, 179 USPQ 421, 424 (CCPA 1973)). Those persons "must be presumed to know something" about the art "apart from what the references disclose." In re Jacoby, 309 F.2d 513, 516, 135 USPQ 317, 319 (CCPA 1962). We next address the obviousness of the following groups of claims:

- claims 1 and 5-7
- claims 2-4
- claims 15-18.

Claims 1 and 5-7

The appellants make three arguments. First, the appellants argue, "The Examiner asserts that claim 1 of the present invention would have been obvious in view of Sato, Dirks and Layton et al. but this is Monday morning quarterbacking." (Appeal Br. at 5.)

The appellants misconstrue the criteria for combining references. "[T]he question is whether there is something in the prior art as a whole to suggest the desirability, and thus

the obviousness, of making the combination.'" In re Beattie, 974 F.2d 1309, 1311-12, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (quoting Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984)).

Here, Sato's invention "concerns a coil component such as a transformer ... or the like, and the manufacturing method thereof, used in electronic equipment." Translation, p. 2. For its part, Layton discloses "a method of forming an electrical coil and the coil formed thereby wherein flat, thin, spaced apart, parallel conductors of rectangular cross-section are formed on a flexible dielectric substrate" Col. 2, ll. 6-9. Specifically, the secondary reference includes the following disclosure.

Accordingly, it is a primary object of this invention to provide a new and improved method of forming a magnetic coil.

A second object of this invention is to provide a new and improved coil of reduced thickness to provide a smaller cross-sectional area and to bring the coil closer to the item being subjected to the induced magnetic field.

Still another object of this invention is to provide a cost effective coil which still meets the foregoing objects.

Still another object of this invention is to provide a coil which allows a choice of design such as the change of pitch to vary the induced magnetic field strength in different areas of the coil and to change the distributed capacitor characteristics of the coil.

Another advantage will be apparent to those skilled in the art on a reading of the following description of the invention in that this coil, and the method of making same, may be utilized where the core or sub-assembly about which the coil is to be placed will not permit the utilization of a rewound or preformed coil. The present invention overcomes this deficiency by being able to be formed in place over the coil or subassembly.

Accordingly, still another object of this invention is to provide a coil and the method of making same where the coil may be formed in place over the core or sub-assembly thereby overcoming a deficiency of preformed coils. Col. 1, l. 42 - col. 2, l. 2.

We are persuaded that Layton's teachings of providing a smaller cross-sectional area, bringing a coil closer to an item, providing cost effectiveness, allowing a choice of design, and being able to be formed in place over a coil or subassembly would have suggested the desirability, and thus the obviousness, of combining Layton's teachings with those of Sato.

In turn, Dirks "describes a surface mount transformer which can be used with automated assembly equipment and which is cost effective." Col. 2, ll. 52-54. Specifically, the reference includes the following disclosure.

The present invention is realized in a specific illustrative embodiment thereof in which a configuration for a power transformer comprises a ferrite core, a molded coil bridge with a plurality of angular leads extending, and a molded spacer and coil cross over with a plurality of angular leads extending which are electrically coupled to the angular leads of the molded coil bridge and etched tracings of a PC board. Moreover, the bridge members are designed to permit precise placement and separation of windings. Advantageously, the windings are separated by a dielectric material and coupled to the angular leads that are designed in a manner similar to a conventional dual-in-line package (DIP). In this manner, board mounting efficiency is substantially increased.

By means of the coupling of the bridge and cross over spacer leads to the PC board, current is introduced into the windings. To maximize coupling efficiency, the surface mount transformer is designed to parameters which can be tightly controlled and to provide precise use of leakage inductance. As a result of the configuration, the windings are advantageously contained, while allowing the ferrite core exposure. By means of this exposure, heat dissipation from the surface transformer is efficiently maximized. Col. 2, l. 57 - col. 3, l. 13.

We are also persuaded that Dirk's teachings of providing cost effectiveness, permitting precise placement and separation of

windings, increasing board mounting efficiency, maximizing coupling efficiency, and maximizing heat dissipation would have suggested the desirability, and thus the obviousness, of combining Dirk's teachings with those of Sato.

Second, the appellants argue, "claim 1 recites that elongated conductors are printed on the flexible sheet. Sato does not disclose such printed conductors. Rather, the conductors of Sato appear to be discrete leads/wires 4 contained within a belt." (Appeal Br. at 4.) They add, "The leads 25, 35 of Dirks are not 'printed' because they extend from the ends of bridges 23 and 24; a 'printed' conductor must be printed on a backing material for support and cannot extend from a bridge without such support." (Id.) The examiner replies, "Printed conductors on a flexible sheet which is flexed or folded to compute a coil are clearly shown by Layton et al." (Examiner's Answer at 4.)

Representative claims 1 specifies in pertinent part the following limitations: "a flexible dielectric sheet and elongated conductors printed on said sheet" In other

words, the limitations recite elongated conductors printed on a flexible, dielectric sheet.

The appellants err in considering the references individually. "Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references." In re Merck & Co., 800 F.2d 1091, 1097, 231 USPQ 375, 380 (Fed. Cir. 1986) (citing In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981)). In determining obviousness, furthermore, a reference "must be read, not in isolation, but for what it fairly teaches in combination with the prior art as a whole." Id., 231 USPQ at 380.

Here, the rejection is based on the combination of Sato, Layton, and Dirks. For its part, Layton teaches elongated conductors printed on a flexible, dielectric sheet. The appellants admit, "Layton et al. disclose a flex circuit comprising a multiplicity of parallel conductors on a dielectric sheet." (Appeal Br. at 5.) The secondary reference specifically discloses "form[ing] a plurality of

flat, parallel, spaced apart copper strip conductors **22** on a suitable flexible dielectric substrate ... to provide a coil blank or workpiece **26** with exposed conductors." Col. 2, 11. 66-68.

In view of this admission and disclosure, we are persuaded that the teachings of Sato, Layton, and Dirks in combination with the prior art as a whole would have suggested the claimed limitations of "a flexible dielectric sheet and elongated conductors printed on said sheet"

Third, the appellants argue, "claim 1 recites that the conductors are surface bonded to respective conductors of the printed circuit board. Sato does not disclose such surface bonding. Rather, the leads/wires 4 of Sato are inserted into throughholes 5." (Appeal Br. at 4.) They add, "because the flex circuit of Layton et al. is closed on itself, there is no surface bonding of the flex circuit coil portion to a printed circuit board" (Id.) The examiner replies, "the conductors 4 of Saito [sic] are considered surface mounted

since solder extends to the surface of the board."

(Examiner's Answer at 4.) He adds, "Dirks has surface bonding between conductors 4 and 5 and discusses through-hole connections in col, [sic] 4, lines 50-52. Layton et al surface bond the ends 30 of his strip conductors 22 to the other ends of these strip conductors to form their coil."
(Id. at 5.)

Representative claim 1 specifies in pertinent part the following limitations: "a flex circuit comprising a flexible dielectric sheet ... conductors of said flex circuit being surface bonded to respective conductors of said printed circuit board" In other words, the limitations recite surface bonding the conductors of the flexible, dielectric sheet to respective conductors of a PCB.

The appellants err in determining the content of the prior art. As mentioned regarding the second argument, Layton discloses the flexible, dielectric sheet with its elongated conductors printed thereon. For its part, Sato discloses surface bonding conductors of a flexible, dielectric sheet to

respective conductors of a PCB. Specifically, "even if a surface-mounted-type substrate with no through holes is used, the same results are obtained." Translation, p. 4.

Dirks, in turn, discloses surface bonding conductors of a dielectric sheet to respective conductors of a PCB. Specifically, "The leads 5 of bridge 3 is mated to the surface of the PC board, or alternatively inserted through openings in the PC board. The preferred embodiment has leads 5 and 6 which mate to the surface of the PC board." Col. 4, ll. 50-53.

In view of these disclosures, we are persuaded that the teachings of Sato, Layton, and Dirks in combination with the prior art as a whole would have suggested the claimed limitations of "a flex circuit comprising a flexible dielectric sheet ... conductors of said flex circuit being surface bonded to respective conductors of said printed circuit board" Therefore, we affirm the rejection of claims 1 and 5-7 under

35 U.S.C. § 103(a). Next, we address the obviousness of claims 2-4.

Claims 2-4

The appellants argue, "Claim 2 ... further recites that elongated conductors are printed on both sides of the flexible dielectric sheet. In contrast, Dirks only teaches conductors embedded within the molded bridges 23 and 24." (Appeal Br. at 5.) They add, "Sato likewise teaches a single set of conductors within the belt. Layton et al. teach a flex circuit but conductors are printed only on one side of the dielectric sheet." (*Id.* at 6.) The examiner replies, "Printed circuit conductors can be applied to one or both sides of printed circuit board or sheet" (Examiner's Answer at 5.)

Claims 2-4 each specify in pertinent part the following limitations: "said conductors are printed on one side of said sheet and ... other elongated conductors printed on the other side of said sheet" In other words, the limitations

recite printing elongated conductors on both sides of the flexible, dielectric sheet.

The examiner fails to show a teaching or suggestion of the claimed limitations in the prior art. "Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor." Para-Ordnance Mfg. v. SGS Importers Int'l, 73 F.3d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995), cert. denied, 519 U.S. 822 (1996) (citing W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1551, 1553, 220 USPQ 303, 311, 312-13 (Fed. Cir. 1983)). "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992) (citing In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)). "It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious."

Id. at 1266, 23 USPQ2d at 1784, (citing In re Gorman, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991)).

Although Layton teaches printing elongated conductors 22 on a flexible, dielectric substrate, it does not teach printing the conductors on both sides of the substrate. To the contrary, the secondary reference shows that the conductors are printed only on one side thereof. Fig. 6. For its part, Dirks does not teach printing elongated conductors on a flexible sheet at all, let alone printing the conductors on both sides of such a sheet. The examiner fails to allege, let alone show, that Sato remedies the defects of Layton and Dirks.

The examiner also fails to allege, let alone show, that the prior art would have suggested the desirability of printing elongated conductors on both sides of the flexible, dielectric sheet. To the contrary, he makes the following admission.

With applicant's dielectric sheet 50 separating the top conductors from the bottom conductors, it would appear that it would be more difficult to connect the

bottom conductor at 244; if only one set of conductors were used for sheet or substrate, the inner conductors could be connected at 244 and then a top or second sheet with its conductors could be applied and connected to 240 in applicant's device. Conductors above and below a printed circuit sheet or board make it more difficult for the connections to the conductors below to be made since upper conductors are already in place when the lower conductor are connected to form the winding. (Examiner's Answer at 5.)

In view of the references' teaching of printing conductors only on one side of a flexible substrate and the examiner's admission that printing conductors on both sides of a sheet would impede connections, we are not persuaded that teachings from the prior art would appear to have suggested the claimed limitation of "said conductors are printed on one side of said sheet and ... other elongated conductors printed on the other side of said sheet" The examiner has impermissibly relied on the appellants' teachings or suggestions; he has not established a prima facie case of obviousness. Therefore, we reverse the rejections of claims 2-4 under 35 U.S.C. § 103(a). Next, and last, we address the obviousness of claims 15-18.

Claims 15-18

The appellants make the following argument.

Claim 15 depends on claim 1 and recites the following additional limitations. The first said elongated conductors printed on the sheet are printed on one portion of the sheet. Other elongated conductors are printed on another portion of the same sheet. These other conductors printed on the sheet are substantially parallel to the first said conductors printed on the sheet. The one portion of the flexible sheet is contoured around a top and sides of one leg of the core. The other portion of the flexible sheet is contoured around a top and sides of an opposite leg of the core. The other conductors printed on the sheet are respectively surface bonded to the other conductors of the printed circuit board to form another series of windings around the core. This key feature is not taught or even suggested by Sato. Instead, Sato discloses two **separate** belts containing the leads 4. Likewise, Dirks discloses two **separate** bridges. See for example Figure 7. Layton et al. add nothing in this regard. (Appeal Br. at 7.)

The examiner's reply follows.

Printing conductors on one belt as opposed to two separate belts is an obvious matter of design choice. For example, belts 3 of Saito could be made in one piece or one belt but it would appear that the connections at 4, 5 would be more cumbersome because handling one long belt and making connections on opposite legs of core 1 would be more difficult. (Examiner's Answer at 6.)

"In the patentability context, claims are to be given their broadest reasonable interpretations. Moreover, limitations are not to be read into the claims from the

specification." In re Van Geuns, 988 F.2d 1181, 1184, 26
USPQ2d 1057, 1059 (Fed. Cir. 1993) (citing In re Zletz, 893
F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)).

Representative claim 15 specifies in pertinent part the
following limitations:

said elongated conductors printed on said sheet are
printed on one portion of said sheet and further
comprising other elongated conductors printed on
another portion of said sheet, said other conductors
printed on said sheet being substantially parallel to
the first said conductors printed on said sheet, said
one portion being contoured around a top and sides of
one leg of said core, said other portion being
contoured around a top and sides of an opposite leg
of said core, said other conductors printed on said
sheet being respectively surface bonded to said
other conductors of said printed circuit board to
form another series of windings around said core.

The language is ambiguous. Giving the claim its broadest
reasonable interpretation, however, the limitations recite
that the flexible, dielectric sheet comprises two portions,
each portion contoured around an opposite leg of a core.

The appellants err in determining the content of the
prior art. Sato discloses a flexible, insulated body,
Translation, p. 4, comprising two portions. The reference

shows that each portion is contoured around an opposite leg of a core 1. Fig. 1.

For its part, Dirks discloses an insulated bridge comprising two portions. The reference shows that each portion 17, 18 is contoured around an opposite leg of a ferrite core 2. Fig. 1.

In view of these disclosures, we are persuaded that the teachings of Sato, Layton, and Dirks in combination with the prior art as a whole would have suggested the claimed limitations of the flexible, dielectric sheet comprising two portions, each portion contoured around an opposite leg of a core. Therefore, we affirm the rejection of claims 15-18 under 35 U.S.C. § 103(a).

CONCLUSION

In summary, the rejection of claims 1, 5-7, and 15-18 under 35 U.S.C. § 103(a) is affirmed. The rejection of claims 2-4 under 35 U.S.C. § 103(a), however, is reversed.

No period for taking any subsequent action in connection
with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

LEE E BARRETT)
Administrative Patent Judge)
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Administrative Patent Judge

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